United States District Court,
N.D. California.

NORTHERN TELECOM LIMITED, a Canadian Corporation,
Plaintiff.
v.
SAMSUNG ELECTRONICS CO., LTD., a Korean Corporation; and Samsung Semiconductor, Inc., a California Corporation,
Defendants.

No. C-95-449 MHP

Sept. 16, 1996.

MEMORANDUM AND ORDER

PATEL**, District Judge.**

Plaintiff Northern Telecom Limited ("Northern Telecom") filed this action for patent infringement against defendants Samsung Electronics Company, Limited and Samsung Semiconductor, Inc. (together, "Samsung"). Samsung counterclaimed for patent invalidity. Now before the court are: (1) Samsung's motion for summary judgment on patent invalidity; and (2) cross-motions for partial summary judgment on claim construction and infringement.

Venue is proper in the Northern District under 28 U.S.C. section 1391, since a substantial part of the events or omissions giving rise to the claims occurred here.

Having considered the parties' submissions and arguments, and for the reasons set forth below, the court enters the following memorandum and order.

BACKGROUND

This litigation concerns a process for etching aluminum, which is useful in the manufacture of semiconductor devices. The manufacture of semiconductors requires that fine line patterns of electrical connections be etched into a conductive film, typically made of aluminum or an aluminum alloy, which is layered over a substrate. To etch the conductive layer with this fine line pattern, a manufacturer first places a mask of non-etchable material, in which a copy of the desired pattern is stamped, over the conductive layer. One of several etching processes is then applied. Any conductive material which is not covered by the masking layer is etched away, leaving the pattern on the surface of the semiconductor.

Until the mid to late 1970s, integrated circuits were manufactured by the application of wet chemicals to etch circuit patterns into conductive material. As semiconductors became smaller, wet etching was no longer sufficient because it was an isotropic process, i.e. it removed material laterally as well as vertically, and therefore undercut the increasingly fine lines of the circuit pattern masks. An anisotropic process, i.e. one that etches only vertically, was needed. Further, wet etching involved large amounts of expensive and environmentally damaging chemicals. Accordingly, a number of researchers undertook to find a suitable process for etching aluminum without using wet chemicals.

In 1975-76, Northern Telecom undertook a research and development project for the United States Army Electronic Command with the goal of devising a new etching technique that would permit manufacture of smaller semiconductor devices. The Northern Telecom project eventually focused on plasma etching, a type of dry etching. A plasma is a state of matter created when voltage is applied to a low-pressure gas, causing the gaseous components to break up into reactive neutrals (radicals), excited neutrals, electrons, positively charged chemical species, and negatively charged chemical species. Hess Decl. para.para. 14 & 17; Cecchi Decl. para. 18. As a whole, a plasma is neither positively nor negatively charged-it is neutral. Plasma etching removes material from the conductive semiconductor layer through a chemical reaction between reactive species of the plasma and the conductive layer. The product of this chemical reaction is then removed from the vacuum chamber where the reaction took place. Hess Decl. para. 13; Cecchi Decl. para. 19.

The Northern Telecom research team discovered that prior attempts to plasma etch aluminum had failed due to the presence of a naturally-occurring layer of aluminum oxide that forms instantaneously on the surface of aluminum when it is exposed to air. Londen Decl., Ex. F (Ingrey Depo.). The team discovered that boron trichloride could be used to plasma etch the aluminum oxide and the aluminum. Londen Decl., Ex. B (ECOM Reports).

The initial patent application disclosing these discoveries was filed on August 16, 1976. It had one independent claim and nine dependent claims. Londen Decl., Ex. H (Ingrey Patent application). The original independent Claim 1 was broader than any claim in the patent as issued, covering a broader category of etchant gases-all gaseous trihalides. FN1 The original Claim 2 was dependent on the original Claim 1 and added the limitation: "said gaseous trihalide comprising at least in part a boron trihalide."

FN1. A gaseous trihalide is any compound having three atoms in the halogen group, including three flourine, chlorine, bromine, or iodine atoms.

On December 9, 1976, the Patent Examiner rejected Claims 1, 3 through 7 and 10 in light of four prior art references: the Fraser patent (U.S. Patent 3,975,252) (reference A), the Zielinski patent (U.S. Patent 3,985,597) (reference B), the Shockley patent (U.S. Patent 3,436,327) (reference C), and the Irving patent (U.S. Patent 3,615,956) (reference D). Londen Decl., Ex. I (Office Action). The Examiner stated Claims 2, 8 and 9 would be allowed if they were rewritten to include all of the limitations in Claim 1.

Northern Telecom responded by amending Claim 1 to include the limitation of boron trihalide formerly in Claim 2, cancelling Claims 2 and 8, and renumbering the remaining claims. In the Response, Northern Telecom's patent prosecutor Sydney T. Jelly also included the following Remarks on the prior art references cited by the Examiner:

It is not agreed that the references cited in any way disclose the present invention as defined by the claims originally filed or as now filed, nor do the references foreshadow the present invention.

The references A, B and C, U.S. patents 3,975,252; [sic] 3,985,597 and 3,436,327 are concerned with a totally different process. In sputter etching the plasma is entirely incidental to the ion bombardment, which bombardment is the etching mechanism. The effect can as readily be affected by using a non-plasma condition by bombarding the surface with ions from an ion gun. Further, a plasma is defined as neutral environment, that is one that has equal members of positive and negative ions. In ion etching (as compared to plasma etching) the target does not sit in the plasma but in a positive space charge.

In the references the plasma plays no part in the etching, being incidental. In the present invention the plasma is part of the etching process in that the etching process uses neutrals, (uncharged particles) in the reaction, these being from the plasma.

MacPherson Decl., Ex. J.

On February 4, 1977, without further comment, the Examiner allowed all pending claims. Londen Decl., Ex. J (Notice of Allowance). U.S. Patent No. 4,030,967 (the " '967 patent" or "Ingrey patent"), entitled "Gaseous Plasma Etching of Aluminum and Aluminum Oxide", was issued on June 21, 1977.

The Ingrey patent contains a total of eight claims. Claim 1 is the only independent claim; Claims 2-8 are all dependent, either directly or indirectly, on Claim 1. Claim 1 of the Ingrey patent in its entirety states: "A process for gaseous etching of aluminum and aluminum oxide, including an initial step of plasma etching in the presence of a gaseous trihalide comprising at least in part, a boron trihalide."

There are several other types of dry etching that are relevant to this litigation. Sputter etching is essentially a mechanical process whereby the metal being etched is bombarded by energetic ions which physically dislodge atoms from the exposed metal. The worksurface to be etched sits on a charged node, sometimes called a cathode. There are no chemical reactions involved in this process. It is an anisotropic but very slow etching process.

A third process, called reactive ion etching, is used by Samsung. FN2 The parties do not appear to disagree that reactive ion etching works by combining the physical and chemical processes of the other two dry etch techniques. In reactive ion etching, both ion bombardment and chemical reaction with a plasma are a part of the etch mechanism. Samsung describes the process as one where a synergism between the physical bombardment by charged particles or ions and the reactive species causes the etching. *See* Samsung's Mem. of Points & Authorities in Support of Mot. for Summary Judgment of Noninfringement at 5. FN3 Northern Telecom contends the process is a species of plasma etching as claimed in the Ingrey patent, describing it as utilization of boron trichloride in a radio frequency plasma to etch aluminum alloys. Londen Decl. Exs. K & L (Kwag and Donohoe Depos.).

FN2. For the purposes of setting forth the relevant facts, the court here refers to reactive ion etching as a distinct type of dry etching. Whether reactive ion etching is encompassed by the Ingrey patent's definition of plasma etching or is, for the purposes of the Ingrey patent, a separate process, is at the heart of this litigation. Samsung characterizes reactive ion etching as an entirely different process from plasma etching, mid-way on the spectrum between sputter and plasma etching. Northern Telecom, on the other hand, characterizes reactive ion etching as a type of plasma etching that also contains the additional element of physical bombardment. The court does not decide that issue by discussing reactive ion etching as a distinct process in this Background section.

FN3. Samsung describes the process thus:
Reactive ion etching bombards the wafer being etched with energetic positively charged ions accelerated from a plasma toward the wafer by a negative voltage intentionally applied to the wafer. Simultaneously, chemically active but electrically neutral (i.e. uncharged) elements called "radicals" from the plasma come into contact with wafer material and chemically react with the material to form volatile compounds which are exhausted from the reaction chamber. Reactive ion etching synergistically combines energetic ion bombardment with chemically active radicals to achieve an etch rate far in excess of what would be achieved by plasma etching or sputter etching alone.

The court recognizes that the above quote, as well as the textual paragraph to which this endnote is attached,

was originally filed by Samsung under seal. However, evidence filed with the court on matters before it cannot be kept under seal in these circumstances.

LEGAL STANDARD

Under Federal Rule of Civil Procedure 56, summary judgment shall be granted "against a party who fails to make a showing sufficient to establish the existence of an element essential to that party's case, and on which that party will bear the burden of proof at trial ... since a complete failure of proof concerning an essential element of the nonmoving party's case necessarily renders all other facts immaterial." Celotex Corp. v. Catrett, 477 U.S. 317, 322-23 (1986); *see also* T.W. Elec. Serv. v. Pacific Elec. Contractors Ass'n, 809 F.2d 626, 630 (9th Cir.1987) (the nonmoving party may not rely on the pleadings but must present significant probative evidence supporting the claim); Anderson v. Liberty Lobby, Inc., 477 U.S. 242, 248 (1986) (a dispute about a material fact is genuine "if the evidence is such that a reasonable jury could return a verdict for the nonmoving party.").

The moving party bears the initial burden of identifying those portions of the record which demonstrate the absence of a genuine issue of material fact. The burden then shifts to the nonmoving party to "go beyond the pleadings, and by [its] own affidavits, or by the 'depositions, answers to interrogatories, or admissions on file,' designate 'specific facts showing that there is a genuine issue for trial.' " Celotex, 477 U.S. at 324 (citations omitted); *see also* Anderson v. Liberty Lobby, Inc., 477 U.S. 242, 248 (1986) (a dispute about a material fact is genuine "if the evidence is such that a reasonable jury could return a verdict for the nonmoving party.").

The moving party does not surmount its initial burden through conclusory allegations as to the state of the material on file; however, it is not required to "support its motion with affidavits or other similar material *negating* the opponent's claim." Celotex, 477 U.S. at 323 (emphasis in original); *see also* Avia Group International Inc. v. L.A. Gear California Inc., 853 F.2d 1557 (Fed.Cir.1988). The moving party discharges its burden by showing that the nonmoving party has not disclosed the existence of any "significant probative evidence tending to support the complaint." First Nat'l Bank v. Cities Serv. Co., 391 U.S. 253, 290 (1968).

Where the moving party has the burden of proof on a claim or defense raised in a summary judgment motion, it must show that the undisputed facts establish every element of the claim or defense. Meyers v. Brooks Shoe Inc., 912 F.2d 1459 (Fed.Cir.1990). When the defendant of a patent infringement claim moves for summary judgment on an affirmative defense, the elements of which the defendant must show by clear and convincing evidence, the non-moving party must simply produce enough evidence to allow a rational trier of fact to find that there is not clear and convincing evidence. As a result of this unusual posture, the non-moving party's burden to come forward with evidence to prevent summary judgment is less stringent than that normally placed on a non-moving party. Schneider (USA) Inc. v. C.R. Bard Inc., 18 U.S.P.Q.2d 1076, 1080 (Mass.1990).

The court's function on a motion for summary judgment is not to make credibility determinations. Anderson, 477 U.S. at 249. The inferences to be drawn from the facts must be viewed in a light most favorable to the party opposing the motion. T.W. Elec. Serv., 809 F.2d at 631.

DISCUSSION

I. Invalidity

Samsung asks the court to find the Ingrey patent invalid on the grounds of anticipation and obviousness. FN4 Northern Telecom opposes this motion, and also asks the court to find the patent valid as a matter of law.

FN4. Samsung reserves the right to challenge the Ingrey patent's validity on other grounds, e.g., indefiniteness and nonenablement.

A. Anticipation

35 U.S.C. s. 102 provides:

A person shall be entitled to a patent unless-

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for patent, or

* * *

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent ..., or

* * *

(g) before the applicant's invention thereof the invention was made in this country by another who had not abandoned, suppressed, or concealed it....

Invalidity for anticipation requires that all of the elements and limitations of the challenged claim are found within a single prior art reference, Scripps Clinic & Research Foundation v. Genentech, Inc., 927 F.2d 1565, 1576 (Fed.Cir.1991), and that the prior art reference is enabling. Id. at 1578. The Federal Circuit has stated that invalidity for anticipation requires that there be no differences between the claimed invention and the reference disclosure, as viewed by a person of ordinary skill in the field of the invention. Id. at 1576. FN5

FN5. Samsung cites a Seventh Circuit case predating the formation of the Federal Circuit for the proposition that the test is one of "substantial identity" between the asserted anticipatory invention and the patent in suit. *See* Roberts v. Sears Roebuck & Co., 723 F.2d 1324 (7th Cir.1983). The Federal Circuit has not adopted the Seventh Circuit's "substantial identity" formulation, holding instead that all of the elements and limitations of the challenged claim must be found within a single prior art reference. Scripps Clinic, 927 F.2d at 1576. Of course, this court is bound to follow Federal Circuit precedent on this issue.

Samsung argues the Ingrey patent is anticipated by U.S. Patent No. 3,951,709 (the " '709 patent" or "Jacob patent"), titled "Process and Material for Semiconductor Photomask Fabrication" and issued on April 20, 1976. MacPherson Decl., Ex. B. Jacob discloses the use of a gaseous plasma including a trihalide to etch various metals. The Ingrey application did not cite the Jacob patent as relevant prior art.

Northern Telecom contends that Jacob omits two key elements of the Ingrey patent and that it is not enabling of the Ingrey invention. First, Northern Telecom argues that the Jacob patent does not include the elements of aluminum and aluminum oxide, which appear in claim 1 of the Ingrey patent. Samsung acknowledges that the Jacob patent does not explicitly mention aluminum, aluminum oxide or any other metal oxide. Taylor Decl., Ex. 2 (Cecchi Depo.).

The claims in the Jacob patent do not identify any specific metals, but provide for a process for etching "metallic material". MacPherson Decl. Ex. B at col. 5. Other references in the patent are to the "etching of various metals (chromium, gold, etc.) capable of forming volatile oxychloride derivatives." Id. at cols. 1 and 2. It is clear that aluminum and aluminum oxide are not specifically mentioned anywhere in the patent.

Samsung argues that since the stability of chromium oxide is comparable to that of aluminum oxide, the etching characteristics of the two metals would also be similar, citing to the Cecchi Declaration at para. 33. Northern Telecom, relying on the Taylor Declaration, Exs. 3 and 4 (Cotton & Wilkinson *Advanced Inorganic Chemistry* and Cecchi declaration, respectively), disputes that the stability of the two oxides is comparable, and also argues that the comparative stability of the two oxides is irrelevant since the Jacob patent fails to explicitly include aluminum.

The evidence Samsung offers in support of its position is of limited probative value. Cecchi merely states that "chromium is well known to oxidize" and then hypothesizes that "the stability of chromium oxide is *comparable* to that of aluminum oxide, *suggesting* that their etching characteristics *would* also be similar." Id. (emphasis added). This statement is couched in such conditional language as to render it speculative. It is, therefore, inadmissible; even if admitted, it is not persuasive for this same reason. Samsung presents no other evidence than this weak statement of Cecchi. It offers no evidence that aluminum comes within the "metallic material" described in the patent or that it is "capable of forming volatile oxychloride derivatives". While it may be that aluminum does fall within this category, there is absolutely no evidence in the record that so states. FN6

FN6. In fact, as discussed under the following section regarding obviousness, Northern Telecom's expert states that aluminum is not such a metal and Samsung's expert does not disagree.

The alleged similarity between chromium and aluminum goes to the question of obviousness, not anticipation. Anticipation requires literal inclusion of every element and limitation in a single prior art reference, which Samsung acknowledges is not present here.

There are other dissimilarities between the two patents that defeat the anticipation defense. For example, the Jacob patent also does not anticipate because it says nothing about etching an oxide layer; it only claims etching one metal layer. The Ingrey patent, on the other hand, involves first etching the surface layer of aluminum oxide and then etching the aluminum layer. Furthermore, in the Ingrey patent boron trihalide is used in the first, or oxide layer, etching. FN7 In the Jacob patent it is listed as one of a number of gases for etching the metallic material, the only layer identified.

FN7. Claim 1 of the Ingrey patent refers to "a gaseous trihalide comprising at least in part, a boron trihalide". Claim 7 adds the additional limitation of boron trichloride. Boron trichloride is a type of gaseous trihalide containing one boron atom and three chlorine atoms.

Northern Telecom also asserts that the reactor identified in the specification of the Jacob Patent is a barrel reactor and Samsung's expert agrees. Taylor Decl., Ex. 8 (Cecchi Depo.) at 244:12-17. Both sides' experts testified that a barrel reactor could not be used to etch aluminum. Id. at 244:18-23 FN8; Taylor Decl., Ex. 9 (Hess Depo.), at 284.

FN8. Dr. Cecchi testified as follows:

Q. Do you know whether aluminum and aluminum oxide can be etched with boron trichloride in a barrel-type reactor?

A. To my knowledge, no one has successfully etched aluminum oxide or aluminum with boron trichloride in a barrel etch reactor.

In addition, Northern Telecom contends that the mention of boron trichloride in the Jacob patent, col. 3, 1.

35-40, is not sufficient to anticipate the Ingrey invention, because it is merely listed along with several other possible etchant gases. Northern Telecom cites to In re Wiggins, 488 F.2d 538, 543 (C.C.P.A.1973) and *Air Products & Chems., Inc. v. Chas. S. Tanner Co.,* 219 U.S.P.Q. 223, 231 (D.S.C.1983), for the proposition that items in a list generally will not anticipate. *Wiggins,* however, involved the listing of numerous speculative compounds. The Jacob patent, while referring to several known gases in the specifications, actually mentioned only boron trichloride and one other gas in the claims themselves. *Air Products* is also inapposite. Regardless of the resolution of this issue, however, the Jacob patent does not contain all of the elements and limitations of the challenged claims in the Ingrey patent for all the reasons set forth above.

Finally, as Northern Telecom points out, Samsung has presented no evidence that the prior reference is enabling. *See* In re Paulsen, 30 F.3d 1475, 1478-79 (Fed.Cir.1994) (holding reference must be enabling in order to anticipate claimed invention.) Although Northern Telecom has submitted evidence that the Jacob invention is not enabling of the Ingrey process, it is unnecessary for the court to evaluate this evidence since there is no evidence to the contrary.FN9

FN9. Specifically, Northern Telecom contends that the Jacob patent teaches use of an "abundance" of oxygen, which would prevent the process disclosed in the Jacob patent from etching aluminum. If high levels of oxygen are added to the etchant, aluminum will oxidize faster than it is etched. Taylor Decl., Ex. 5 (Hess Depo.), at 266. Thus, large amounts of oxygen will defeat a key feature of the Ingrey patent's invention-the use of boron trichloride to remove the native oxide layer from the surface of the aluminum.

For all of the reasons stated above, the court finds Samsung has failed to establish by its burden of clear and convincing evidence, or by any lesser standard, that it is entitled to summary judgment on its affirmative defense of anticipation. The court further finds that Northern Telecom is entitled to summary judgment. Although district courts may not generally grant summary judgment to a nonmoving party sua sponte, a court may do so if the losing party has had " 'reasonable notice that the sufficiency of his or her claim will be in issue....' " O'Keefe v. Van Boening, 82 F.3d 322, 324 (1996) (quoting Buckingham v. United States, 998 F.2d 735, 742 (9th Cir.1993)). " 'Reasonable notice implies adequate time to develop the facts on which the litigant will depend to oppose summary judgment.' " *Id.* (quoting Portsmouth Square Inc. v. Shareholders Protective Comm., 770 F.2d 866, 869 (9th Cir.1985)). Here, Samsung had ample time opportunity to address the issue and develop the facts, by briefing its own motion for summary judgment. Thus, it is proper for this court to grant summary judgment to Northern Telecom.

B. Obviousness

35 U.S.C. s. 103 provides:

A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.

Obviousness is a question of fact that is determined with reference to (1) the scope and content of the prior art; (2) differences between the prior art and the claims at issue; (3) the level of ordinary skill in the art; and (4) secondary evidence of nonobviousness. Graham v. John Deere Co., 383 U.S. 1, 17-18 (1966). Secondary evidence of nonobviousness includes the commercial success of the invention, long-felt but unsolved need, failure of others to solve the problem, licensing of the patented invention, professional recognition and approval, and copying of the invention. *Id.;* Minnesota Mining & Mfg. Co. v. Johnson & Johnson Orthopaedics, Inc., 976 F.2d 1559, 1573 (Fed.Cir.1992).

Samsung argues that the invention set forth in the Ingrey patent would have been obvious at the time it was

made to one of ordinary skill in the art in light of either the Jacob patent alone, or in light of the Jacob patent together with either the Abe or Irving prior art references.

1. The Jacob patent alone

Samsung contends that despite the omission of aluminum in the Jacob patent, the patent obviously suggested aluminum because aluminum is a common metal and frequently used in the manufacture of semiconductors. The evidence Samsung offers in support of this statement is based solely on the Cecchi declaration. Comparing the claims in Ingrey to the Jacob patent, Cecchi asserts that the phrase "various metals (chromium, gold, etc.)" renders the use of aluminum as one of these metals obvious because "the common metal aluminum is one of the first metals that to come to mind in semiconductor processing." Cecchi Dec. at para. 35. This statement is of no evidentiary value. It is a casual observation that is vague and without foundation and, therefore, inadmissible.

In response, Northern Telecom points to several ways that the Jacob patent teaches that aluminum is not among the metals it includes. First, Jacob's specifications state it enables the etching of "various metals (chromium, gold, etc.) capable of forming volatile oxychloride derivatives." Taylor Decl., Ex. 2 (Jacob patent), col. 1, l. 9-11. Northern Telecom presents evidence that aluminum is not capable of forming volatile oxychloride derivatives. Taylor Decl., Ex. 13 (Hess Depo.). Samsung's expert did not dispute this point. Taylor Decl., Ex. 15 (Cecchi Depo.). Further, Jacob's specifications define the appropriate metals as those which do not have volatile chlorides. Taylor Decl., Ex. 2 (Jacob patent), col. 4, l. 7-10. Northern Telecom asserts that the chloride of aluminum *is* volatile. Taylor Decl., Ex. 16 (Cecchi depo.).

Northern Telecom argues that these references in the specifications are consistent with Jacob's teaching that a gas such as boron trichloride be mixed with oxygen to form the etchant. The Jacob process was intended to facilitate "the preferential formation of the volatile oxychlorides over the straight, nonvolatile chlorides of the metals." Taylor Decl., Ex. 2 (Jacob patent), col. 4, l. 10-12. Since the chloride of aluminum is volatile and aluminum will not form volatile oxychlorides, application of the Jacob process to aluminum would cause the aluminum oxide layer to replenish much faster than the boron trichloride could remove it. Hence, no etching would occur. FN10

FN10. Northern Telecom contends that the statement in the Ingrey patent that a volatile oxychloride participates in removing the aluminum oxide refers to a boron oxychloride, not an aluminum oxychloride. *See* Taylor Decl., Ex. 14 (Lab. notebook) at NT555.

In view of the paucity of probative evidence in support of Samsung's argument on obviousness based on the Jacob patent alone, the court finds that Samsung is not entitled to summary judgment on this issue. This does not depend upon the weighing of conflicting declarations and deposition testimony, but upon the dearth of Samsung's evidence which viewed in the light most favorable to Samsung fails to establish its affirmative defense. In view of the strength of Northern Telecom's evidence that Ingrey's teachings would not be obvious to one skilled in the art on the basis of the Jacob patent alone, and in light of Samsung's lack of evidence, the court finds that Northern Telecom as the non-moving party is entitled to summary judgment on this issue. *See* O'Keefe, 82 F.3d at 324.

2. The Abe reference and Irving patent

Samsung then argues that the Ingrey patent is obvious in light of the Jacob patent together with either an article published by Haruhiko Abe et al., MacPherson Decl., Ex. KK (Haruhiko Abe, et al., *Microfabrication of Anti-Reflective Chromium Mask by Gas Plasma*), or the Irving patent, MacPherson Decl., Ex. I, which was cited as prior art in the Ingrey application.

The Abe article discusses a plasma process for removing a native oxide layer from chromium:

... as is well known, the basic reaction of gas plasma etching effects is a chemical reaction of the active atomic species with the materials to be etched. In these experiments, the active chlorine species and also the active oxygen species seems to react with the chromium and chromium oxide films to produce some volatile material which are not detected experimentally.

MacPherson Decl., Ex. KK. It is not clear to the court how this reference adds anything to the prior art beyond what is disclosed in the Jacob patent. The Abe reference discusses the interaction between chlorine in a plasma and chromium and chromium oxide, as does the Jacob patent. The Abe reference does not advance Samsung's obviousness argument beyond what is accomplished by the Jacob patent alone.

The Irving patent discloses the use of a chlorine-based gas in connection with etching of aluminum. *See* MacPherson Decl., Ex. I (Irving Patent). However, Samsung makes no attempt to link together the Jacob and Irving patents in order to establish that one skilled in the art at the time of the Ingrey patent would find the Ingrey disclosures obvious. Samsung's expert merely incants the conclusion that it would have been obvious without enumerating any factual basis for this opinion. *See* Cecchi Decl. para.para. 39, 40 and 41. These conclusory allegations do not suffice to support a motion for summary judgment on obviousness in favor of Samsung or to overcome a counter-motion. This lack of probative evidence together with Northern Telecom's evidence that such a combination would not be obvious to one skilled in the art in 1976, Taylor Decl., Exs. 18 (Hess Depo.) at 295 & 19 (Ingrey Depo.) at 470-71, is sufficient to grant summary judgment for Northern Telecom on the affirmative defense of obviousness.

II. Claim Construction

Under Markman v. Westview Instruments, Inc., 52 F.3d 967, 979 (Fed.Cir.1995), *affirmed* 116 S.Ct. 1384 (1996), the court "has the power and obligation to construe as a matter of law the meaning of language used in the patent claim." The meaning of claims is ascertained from consideration of three sources: the claim language, the patent specification, and the prosecution history. *See* Vitronics Corp. v. Conceptronic, Inc., 90 F.3d 1576, 39 U.S.P.Q.2d 1573 (Fed.Cir.1996). In construing the meaning of claim language, the court should look first at the claims themselves, then use the specifications to aid in defining the terms used in the claims, and finally, turn to the prosecution history if necessary. Id. at 1582. Ordinarily this intrinsic evidence should be sufficient to resolve any ambiguities and determine the meaning of the claims. Id. at 1583. Only when it is not may the court use extrinsic evidence and then only to aid the court in "coming to the proper understanding of the claims" and the technology involved. *Id*. Expert testimony is to be eschewed and used only as a last resort. *Id*. The Federal Circuit in *Vitronics* showed a clear preference for other types of extrinsic evidence such as dictionaries and prior art documents. *Id*. at 1585.FN11

FN11. After the Supreme Court's decision in *Markman,* this court asked the parties to brief the issue of burden of proof on claim construction. Having reviewed those memoranda and the Federal Circuit's recent decision in *Vitronics,* the court concludes that traditional burdens of proof, production and rebuttal do not apply for the following reasons.

Claim construction is the first part of a two-part analysis in an action for infringement, the second part being the determination of whether the accused device or method infringes the claims at issue. The party claiming that its patent has been infringed ordinarily carries the burden of proof. Wilson Sporting Goods v. Davis Geoffrey & Assoc., 904 F.2d 677, 685 (Fed.Cir.), *cert. denied,* 498 U.S. 992 (1990). However, only the second part is tried to a jury or finder of fact. The claim construction is determined as a matter of law, Markman v. Westview Instruments Inc., 517 U.S. 370, 116 S.Ct. 1384, 1396 (1996), and matters of law generally are not subject to traditional burdens of proof.

In its most recent claim construction decision, *Vitronics,* the Federal Circuit does not articulate any burden of proof. The case makes clear that it is the duty of the court considering all of the appropriate evidence, regardless of who produced it, to determine the proper interpretation of the claims. Furthermore, since a district court's claim construction is reviewed de novo, Vitronics, 90 F.3d at 1582, a burden of proof approach would make no sense.
These instructions guide this court in construing the claims at issue here-"plasma etching" and "aluminum and aluminum oxide."

A. "Plasma Etching"

Samsung argues that "plasma etching" as used in the Ingrey patent has a narrow meaning. Samsung contends plasma etching means: a strictly chemical process where the wafer being etched sits in a plasma, there is no bias potential (electrical charge) intentionally applied and the pressure is so high that there is negligible ion bombardment, for purposes of etching the wafer by direct involvement of the plasma, and which results in isotropic etching. Samsung identifies a number of differences between the process it practices-reactive-ion etching-and its definition of plasma etching as used in the Ingrey patent.

Northern Telecom, on the other hand, argues that plasma etching as envisioned by the Ingrey patent encompasses etching conducted in a broad range of reactors and under different process conditions, so long as the initial step involves a gaseous trihalide, comprising at least in part a boron trihalide, which is broken up in a radio frequency plasma into chemically active radicals that react with aluminum and aluminum oxide to form a volatile compound that can easily be removed from the etching chamber. This definition includes reactive ion etching as practiced by Samsung. Put another way, Northern Telecom contends the Ingrey patent does not exclude processes in which mechanisms in addition to the chemical reactions in a plasma-e.g., ion bombardment of the work surface-contribute to the etching.

Although plasma etching is not defined in the Ingrey patent's claims themselves, it is described in the specifications as follows:

In plasma etching, etchant gas molecules are broken up in an RF plasma into chemically active radicals that react with the workpiece, etching occurs and, if the reaction products are volatile, the reaction will continue until one or other of the reactants is completely removed.

Hess Decl., Ex. A (Ingrey patent), col. 1, 1.37-42. Northern Telecom argues the court need only look to this definition to determine the meaning of plasma etching in the claims, while Samsung argues that the meaning of plasma etching must also be interpreted in light of the prosecution history, the remainder of the patent specifications, and relevant extrinsic evidence.

While it is axiomatic that neither the prosecution history nor the specifications can be used to enlarge, diminish or vary the limitations of the claims, nothing in this rule implies the court should not consider both the specifications and the prosecution history in interpreting what the claims mean. *See* Markman, 52 F.3d at 980. Indeed, the Federal Circuit has clearly held that courts should interpret the meaning of claim language with reference to such evidence. *Id*. Accordingly, the court will consider the specifications and the prosecution history in determining the meaning of the terms used in the claims.

1. Prosecution History/File Wrapper Estoppel

The centerpiece of Samsung's claim construction argument are statements made by Northern Telecom to the Patent Examiner in the "Remarks" section of its January 7, 1997 Response to the Examiner's initial rejection. *See* MacPherson Decl., Ex. J (Response). Northern Telecom contends that the Remarks are irrelevant because the Examiner had already determined that claims in the amended form would be allowable, *see* Londen Decl., Ex. I (PTO Office Action), and thus the Examiner did not rely on the Remarks.

A patentee who construes the claims in a patent application narrowly before the Patent Office is estopped from later construing them broadly before the courts. Autogiro Co. of America v. United States, 384 F.2d 391, 399 (Ct.Cl.1967), *cert. denied,* 434 U.S. 1051 (1978). Assertions made by a patent applicant to the Patent and Trademark Office in support of patentability are part of the file wrapper or prosecution history and may be used to interpret the claims and define their terms. Id. at 398-99.FN12

FN12. This is not to be confused with file wrapper estoppel used in the doctrine of equivalents. *See* E.I. Du Pont De Nemours & Co. v. Phillips Petroleum Co., 849 F.2d 1430, 1437 (Fed.Cir.), *cert. denied,* 488 U.S. 986 (1988).

Here, it is not at all clear that the Examiner did not rely on the Remarks. While the Examiner had indicated that with the suggested amendments the claims would be allowable, the Examiner did not actually issue the Notice of Allowance until February 4, 1977, after receiving the Response which contained both the amendments and the Remarks. *See* Supp. MacPherson Decl., Ex. B (communication from Examiner closing prosecution on merits in view of January 17, 1977 response). Thus, it is reasonable to assume that the Examiner at least read the Remarks prior to issuing the Notice. However, whether or not the Examiner relied on the Remarks, the Federal Circuit has clearly stated that such representations, whether or not made to secure patentability, may estop the patentee from subsequently advancing a contrary interpretation and are relevant to ascertaining what the applicant meant by terms used in the claims. *See* E.I. Du Pont De Nemours & Co. v. Phillips Petroleum Co., 849 F.2d 1430, 1438 (Fed.Cir.), *cert. denied,* 488 U.S. 986 (1988). Accordingly, Northern Telecom's assertion that the Remarks are irrelevant to claim construction is incorrect.

In its January 17, 1977 Response to the Examiner's initial rejection of the Ingrey application, Northern Telecom amended the claims in conformity with the Examiner's suggestions and also made the following Remarks:

It is not agreed that the references cited in any way disclose the present invention as defined by the claims originally filed or as now filed, nor do the references foreshadow the present invention.

The references A, B and C, U.S. patents 3,975,252; [sic] 3,985,597 and 3,436,327 are concerned with a totally different process. In sputter etching the plasma is entirely incidental to the ion bombardment, which bombardment is the etching mechanism. The effect can as readily be affected by using a non-plasma condition by bombarding the surface with ions from an ion gun. Further, a plasma is defined as neutral environment, that is one that has equal members of positive and negative ions. In ion etching (as compared to plasma etching) the target does not sit in the plasma but in a positive space charge.

In the references the plasma plays no part in the etching, being incidental. In the present invention the plasma is part of the etching process in that the etching process uses neutrals, (uncharged particles) in the reaction, these being from the plasma.

MacPherson Decl., Ex. J.

The court must determine whether these Remarks distinguish the Ingrey invention from sputter etching or from reactive ion etching. Unfortunately, while the question is straightforward, the answer is not, due to mistakes and poor draftsmanship which render the Remarks fundamentally ambiguous.

The parties agree that references A (Fraser) and B (Zielinski) disclose reactive ion etching processes, i.e. etch mechanisms that include both ion bombardment and chemical reactions involving plasmas, and that reference C (Shockley) discloses a sputter etching process, i.e. one that is purely mechanical.

Paragraph 2 of the Remarks begins with the statement: "[t]he references A, B, and C ... are concerned with a totally different process." This suggests that the Remarks define plasma etching as a purely chemical process and distinguish it from processes which include the physical component of ion bombardment. FN13 Read in isolation from the surrounding sentences, this sentence appears to distinguish the Ingrey invention from prior art references disclosing reactive ion etching. The next sentence, however, refers to sputter etching ("[i]n sputter etching the plasma is entirely incidental to the ion bombardment, which bombardment is the etching mechanism"), indicating that Northern Telecom's patent agent Sidney Jelly may have misunderstood or overlooked what references A and B disclosed.

FN13. Northern Telecom attempts to construe this statement as a reference to the fact that the Ingrey patent discloses the use of a boron trihalide and the three references do not; this attempt fails completely. In context, it is clear that the Remarks are concerned with the etch mechanism, not the etch gas.

Samsung suggests a different interpretation. Samsung argues that the second and third sentences (beginning "In sputter etching ...") refer to reference C, which discloses a sputter etching process, while the fourth and fifth sentences refer to references A and B, which disclose reactive ion etching. Under this interpretation, Jelly used the term "ion etching" to mean reactive ion etching. This interpretation is attractive because it allows paragraph 2 to be read as internally consistent.

Samsung's interpretation of the terms "sputter etching", "ion etching", and "plasma etching" in paragraph 2 is the most sensical one presented to the court. However, Samsung's proposed interpretation of paragraph 2 is not consistent with any reasonable interpretation of paragraph 3. Paragraph 3 appears to contrast the three references as a group to the use of chemical reactions in a plasma. The parties agree that the statement in paragraph 3 that "[i]n the references the plasma plays no part in the etching, being incidental" does not as a simple matter of fact correctly describe the processes in references A and B. In fact, references A and B disclose reactive ion processes, a process in which the plasma *does* play an active role in etching the work surface. Thus, paragraph 3 suggests that Jelly did not know that references A and B disclosed processes which were in part chemical. This is evidence that he used the terms "sputter etching" and "ion etching" interchangeably to refer to an exclusively mechanical process.

Samsung is correct that Northern Telecom must be held to the representations it made to the Examiner, whether factually correct or not. However, Northern Telecom is correct that the factually erroneous remark in paragraph 3, which perhaps pervades the Remarks as a whole, cannot be interpreted to hold the meaning Samsung wishes to give it-that the Ingrey patent claims only an exclusively chemical etch mechanism. When the first sentence of paragraph 3 is placed in context with the second, which states: "[i]n the present invention the plasma is *part* of the etching process ..." (emphasis added), it is obvious that Samsung's preferred interpretation of the Remarks as a whole is not a reasonable one. If a person skilled in the art was familiar enough with references A and B to be aware of the factual error in the first sentence, that person would have to disregard that sentence as nonsensical. In that case, the first sentence would shed no light on the meaning of the second sentence, which is crucial here. If, on the other hand, a person skilled in the art was not familiar enough with references A and B to be aware of the factual error, that person would interpret paragraph 3 to mean Ingrey was claiming a process where plasma was a part of the etch mechanism. Neither situation lends itself to an interpretation that Ingrey was claiming a process in which plasma was the exclusive etch mechanism. Read as a whole, the third paragraph clearly does not indicate that the claimed invention is exclusively chemical, but only that it is at least partly so.

In light of the ambiguities and errors which pervade the Remarks, the court concludes that it cannot be known with certainty precisely what Jelly meant by "sputter etching", "ion etching", and "plasma etching." The Remarks are so muddled as to shed little light on the claim construction question before the court. Thus, while the court finds that Northern Telecom's interpretation is the more reasonable, the court places little

weight on the Remarks in construing the disputed claims.

2. The Specifications

It is axiomatic that limitations that do not appear in the claims cannot be imported from the specification. *See* Markman, 52 F.3d at 979-80. "[O]ne cannot avoid infringement merely by adding elements if each element recited in the claims is found in the accused device." Stiftung v. Renishaw PLC, 945 F.2d 1173, 1178 (Fed.Cir.1991) (quoting A.B. Dick Co. v. Burroughs Corp., 713 F.2d 700, 703, *cert. denied,* 464 U.S. 1042 (1984)). Thus, the court examines the specifications solely for the light they shed on the meaning of plasma etching as used in the claims. *See* Unique Concepts, Inc. v. Brown, 939 F.2d 1558, 1561 (Fed.Cir.1991). The specifications are the "single best guide to the meaning of a disputed term". Vitronics, 90 F.3d at 1582. In this case, the court must determine whether the specifications establish that plasma etching as used in Claim 1 precludes the use of a process that also involves ion bombardment.

The Ingrey specifications describe plasma etching as follows:

In plasma etching, etchant gas molecules are broken up in an RF plasma into chemically active radicals that react with the workpiece, etching occurs and, if the reaction products are volatile, the reaction will continue until one or other of the reactants is completely removed.

Hess Decl., Ex. A (Ingrey patent), col. 1, l.37-42. This sentence does not appear on its face to describe an exclusive process.

Samsung points to two other portions of the specifications to support its theory that reactive ion etching is outside the scope of the patent. First, the specifications describe parameters for the etching equipment: "Further constraints on the plasma parameters are that the RF power should be sufficiently low as not to damage the photoresist through ion bombardment...." *Id.* at col. 2, l. 53-56. Second, the specifications indicate that high pressure should be used, which suppresses ion bombardment. (In reactive ion etching as practiced by Samsung, low pressure is used in order to promote ion bombardment.) Samsung interprets this language to mean that in the claimed process ion bombardment should not occur. Northern Telecom interprets the same language as evidence that ion bombardment does in fact occur in the plasma etching process described in the specifications.

The Ingrey patent is a process patent, not a patent on a particular apparatus. In a process patent, apparatus distinctions that are not specifically claimed are not controlling in determining the scope of the claims. *See* Polaroid Corp. v. Eastman Kodak Co., 789 F.2d 1556, 1562 (FedCir.), *cert. denied,* 479 U.S. 850 (1986), and Amstar Corp. v. Envirotech Corp., 730 F.2d 1476, 1482 (Fed.Cir.), *cert. denied,* 469 U.S. 924 (1984). The specifications show that the Ingrey inventors considered ion bombardment, or at least some excessive level of ion bombardment, to be deleterious. In so showing, the cited lines also indicate that a certain amount of ion bombardment does occur in the embodiment described in the specifications. Thus, the specifications demonstrate, and all the other evidence in the record agrees, that ion bombardment will take place even in the embodiment described in the specifications.

While the embodiment set forth in the specifications minimizes ion bombardment, the claims themselves concern only the chemical reactions taking place in a plasma. They do not speak to whether the ion bombardment which will take place is minimized, as in the Ingrey embodiment, or enhanced, as in reactive ion etching as practiced by Samsung. The court discerns no language in the specifications indicating that the claims are limited to a process of chemical reaction in which ion bombardment is limited or reduced below some specified level.

3. Extrinsic Evidence

The parties agree that terminology in the field of semiconductor manufacturing was not used consistently or without ambiguity in the late 1970s. Samsung nevertheless contends that those skilled in the art in the late 1970s would understand the term "plasma etching" to exclude the process called reactive ion etching, and submits substantial evidence to support this position. *See* Supplemental Cecchi Decl. Northern Telecom submits a volume of contrary evidence. *See* Hess Decl. para.para. 24-25. There is ample evidence that each of the terms in question were used in the industry in the late 1970s in a variety of ways and without much consistency. However, in light of *Vitronics,* it is clear that the court should not weigh the opinions of competing experts in order to define the terms because that would likely vary or contradict the claim language. The court finds that it should and can interpret the claims based on the specifications and prosecution history. Based upon those, the court concludes that the term "plasma etching" refers to a chemical process without excluding the non-chemical process of ion bombardment. While the evidence is far from clear, and the prosecution history in particular presents serious problems of interpretation, the court finds that Claim 1, read together with the specifications and prosecution history, contains no indication that ion bombardment or reactive ion etching is specifically excluded from the claimed process.

B. "Aluminum and Aluminum Oxide"

Claim 1 of the Ingrey patent claims "a process for gaseous etching of aluminum and aluminum oxide." Samsung contends the language "aluminum and aluminum oxide" must be construed to mean substantially pure aluminum together with the oxide that forms naturally upon it, not any aluminum-based alloy together with its aluminum oxide layer. Samsung manufactures semiconductors from alloys such as aluminum silicon or aluminum silicon copper.

Samsung submits evidence that persons ordinarily skilled in the art in the mid-1970s would understand aluminum to mean substantially pure aluminum. Cecchi Decl. para.para. 30-32. In support of its position, Samsung argues that etching of aluminum alloys poses different problems than those posed by the etching of pure aluminum. Specifically, etching aluminum alloys requires an additional step of removing a silicon or copper residue that is left on the chip surface after the aluminum is removed.

Northern Telecom submits evidence, contrary to that offered by Samsung, that a person ordinarily skilled in the art in the mid-1970s would understand aluminum and aluminum oxide to encompass aluminum alloys. *See, e.g.,* Taylor Decl., Exs. 51 & 52. Thus, Northern Telecom argues that Samsung's manufacture of semiconductors from aluminum alloys such as aluminum silicon or aluminum silicon copper is included within the scope of the Ingrey patent.

1. Intrinsic Evidence

As *Vitronics* makes clear, a court constructing a claim must rely primarily on "intrinsic evidence of record, i.e., the patent itself, including the claims, the specification and, if in evidence, the prosecution history." Vitronics, 90 F.3d at 1582. Of paramount importance are the words of the claim itself, which should generally be given their "ordinary and customary meaning." *Id.* Although "a patentee may choose to be his own lexicographer and use terms in a manner other than their ordinary meaning," he or she may do so only if "the special definition of the term is clearly stated in the patent specification or file history." *Id.*

Here, the Ingrey patent claims a process for the plasma etching of "aluminum and aluminum oxide." In the patent, aluminum and aluminum oxide are specified and they are referred to by their periodic table notations (i.e. A1 and A12 03) (subscript notation not available). No alloys are mentioned by name or by their compound periodic table notations. Neither the claim itself nor the specifications specially defines the meaning of either aluminum or aluminum oxide. In addition, the prosecution history of the Ingrey patent contains no information, such as representations by the patent applicant, that is helpful in determining whether "aluminum and aluminum oxide" should be read to include aluminum alloys.

Because terms in a claim are to be given their "ordinary and customary meaning," this court finds that aluminum alloys are not included within the scope of the Ingrey patent. Northern Telecom has offered no intrinsic evidence showing that aluminum alloys are encompassed within the terms "aluminum and aluminum oxide." Rather, Northern Telecom relies on extrinsic evidence such as the testimony of experts FN14 to support its claim that "aluminum and aluminum oxide" should be construed to include aluminum alloys. However, as *Vitronics* makes clear, extrinsic evidence in general, and expert evidence in particular is to be used "only if the patent documents, taken as a whole, are insufficient to enable the court to construe disputed claim terms. Such instances will rarely, if ever, occur." Vitronics, 90 F.3d at 1585. Thus, the court concludes that the term "aluminum and aluminum oxide" in the Ingrey patent refers solely to substantially pure aluminum and its native layer of aluminum oxide, and not to alloys such as aluminum silicon or aluminum silicon copper.

FN14. Even were the court to find that the intrinsic evidence was insufficient to enable it to construct the disputed term, Northern Telecom would probably not be able to rely on expert testimony. Even in the "rare instances" where extrinsic evidence is necessary to construct a claim, expert testimony is frowned upon. Vitronics, 90 F.3d at 1585. Instead "prior art documents and dictionaries ... are more objective and reliable guides. Unlike expert testimony, these sources are accessible to the public in advance of litigation," and "are to be preferred over opinion testimony." *Id*.

III. Infringement

Northern Telecom contends that even though this court has concluded that "aluminum and aluminum oxide" does not encompass aluminum alloys, the Ingrey patent is nonetheless literally infringed. According to Northern Telecom, the patent, although not referring directly to aluminum alloys, *does* encompass the etching of the pure aluminum content of aluminum-based metal alloys. Samsung does not dispute that it etches aluminum silicon and aluminum silicon copper in the presence of a boron trichloride plasma.

Samsung does allege, however, that the etching of aluminum alloys, as opposed to pure aluminum, causes a residue of silicon or silicon and copper to be left on the chip surface. This residue must subsequently be removed. Samsung maintains that this extra step of removing the residue prevents its etching process from infringing on the Ingrey patent. According to Samsung, etching of the alloys is not actually completed until the residues have been removed.

The court finds the extra step of removing the silicon or silicon copper residue does not prevent Samsung from infringing on the Ingrey patent. As Northern Telecom points out, Samsung does not dispute that the type of etching it utilizes, namely etching with boron trichloride in a plasma, removes all of the aluminum in the aluminum silicon or aluminum silicon copper alloys. FN15 In so doing, Samsung literally infringes the Ingrey patent. The Ingrey patent does not pretend to claim *all* the steps necessary to manufacture semiconductor chips, but only the step of etching aluminum and aluminum oxide. Thus, the fact that Samsung must perform an additional step of removing silicon or copper residues after it has etched away the aluminum does not render its process noninfringing.FN16

FN15. As Northern Telecom also notes, the plasma etching process does, in fact, remove the aluminum alloys; after the removal of the aluminum, what remains is, by definition, no longer an aluminum alloy.

FN16. Because the court has concluded that Samsung literally infringes the Ingrey patent, it need not reach Northern Telecom's argument that disputed issues of material fact remain which preclude the court from resolving the question of whether Samsung infringes under the doctrine of equivalents.

CONCLUSION

Accordingly,

1. Samsung's motion for summary judgment of patent invalidity based on anticipation is DENIED. Summary judgment is GRANTED to Northern Telecom on this issue.

2. Samsung's motion for summary judgment of patent invalidity based on obviousness is DENIED.

3. Samsung's motion for summary judgment on claim construction of "plasma etching" is DENIED, while its motion for summary judgment on claim construction of "aluminum and aluminum oxide" is GRANTED; Northern Telecom's countermotion for summary judgment on claim construction of "plasma etching" is GRANTED, while its motion for summary judgment on claim construction of "aluminum and aluminum oxide" is DENIED.

4. Samsung's motion for summary judgment on noninfringement is DENIED; Northern Telecom's motion for summary judgment on infringement is GRANTED.

IT IS SO ORDERED.

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